182685-0010

(12) UK Patent Application (19) GB (11) 2 330 230 (13) A

(43) Date of A Publication 14.04.1999

(21) Application No 9721518.0

(22) Date of Filing 11.10.1997

(51) INT CL[6]
G08B 25/14 25/10 26/00 27/00 29/12 29/16

(52) UK CL (Edition Q)
G4H HNEM HNK H1A H14D H14G H60
U1S S2192

(56) Documents Cited
GB 2207266 A EP 0599192 A1

(58) Field of Search
UK CL (Edition P) G4H HNEC HNEE HNEM HNG HNK HNLA HNMB
INT CL[6] G08B

(71) Applicant(s)
Menvier (Electronic Engineers) Limited
(Incorporated in the United Kingdom)
Southam Road, Banbury, Oxfordshire OX16 7RX,
United Kingdom

(72) Inventor(s)
Angus Jonathan Bertram Stone

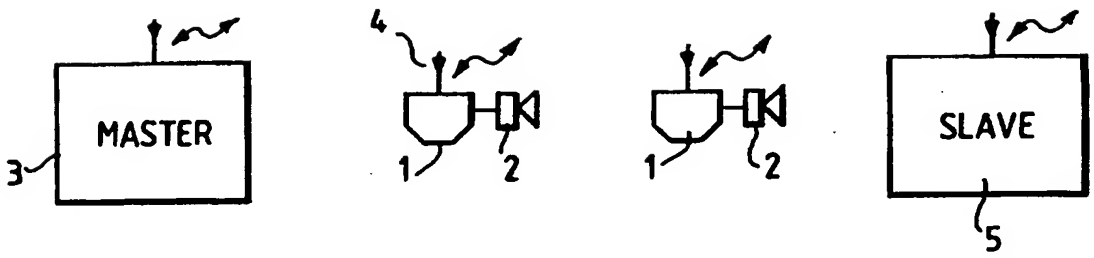
(74) Agent and/or Address for Service
Saunders & Dolleymore
9 Rickmansworth Road, WATFORD, Herts, WD1 7HE,
United Kingdom

(54) Abstract Title
Alarm or detection system

(57) An alarm system (e.g. using radio) comprises a plurality of remote detection and/or indicating devices and at least two physically separated functional control panels, each control panel being capable of fully controlling the alarm system, such that at any time one of the control panels is used as a master control panel. The rate at which the devices are to notify their states to the master can be specified by the master. Sounders associated with detection devices can be controlled via the latter by the master.

GB 2 330 230 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.



Add ① OK ?

OK

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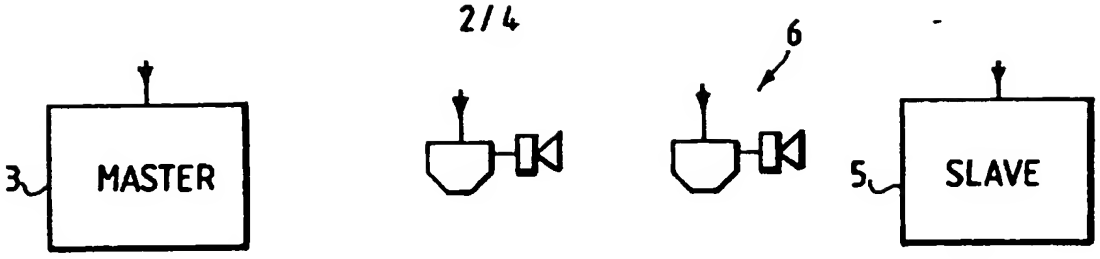
OK

Fig.1.



Add ① OK?

OK

Add ② OK?

FIRE !

Add ③ OK?

OK

Add ① Sound

OK

Add ② Sound

OK

Add ③ OK?

OK

⋮

Operator presses silence alarm control on slave.

Add ① OK?

OK

Add ② OK?

OK

Add ③ OK?

Silence.

Add ① Silence

OK

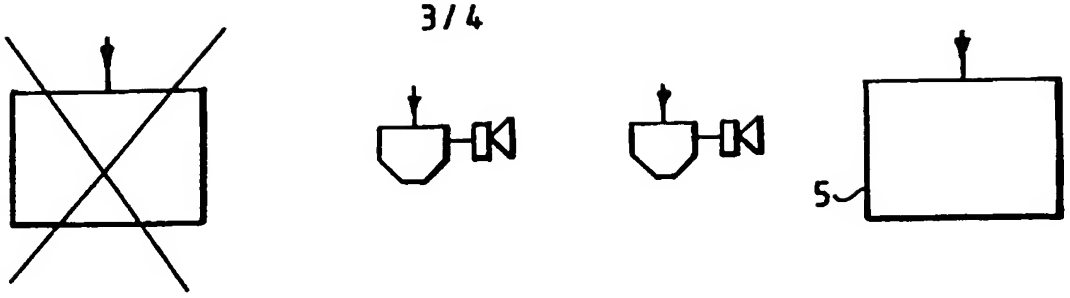
Add ② Silence

OK

Add ③ OK?

OK

Fig.2.



TIME OUT PERIOD

Add ① OK?

OK

Add ② OK?

OK

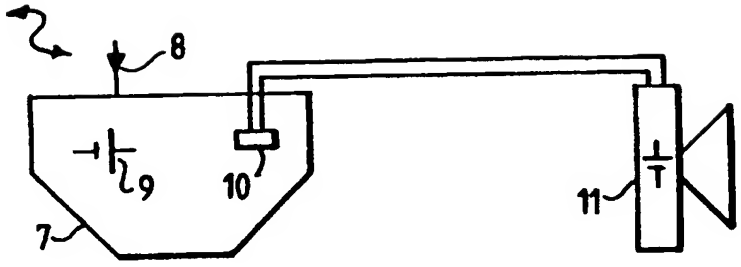


Fig.4.

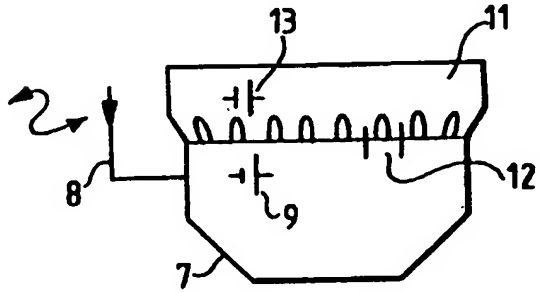


Fig.5.

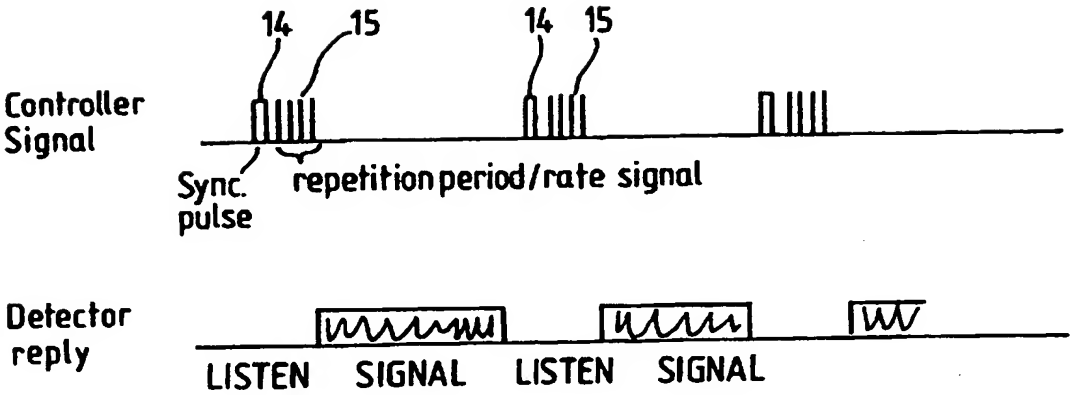

14
15
14
15
Controller Signal
Sync. pulse
repetition period/rate signal
Detector reply
LISTEN
SIGNAL
LISTEN
SIGNAL

Fig.6.

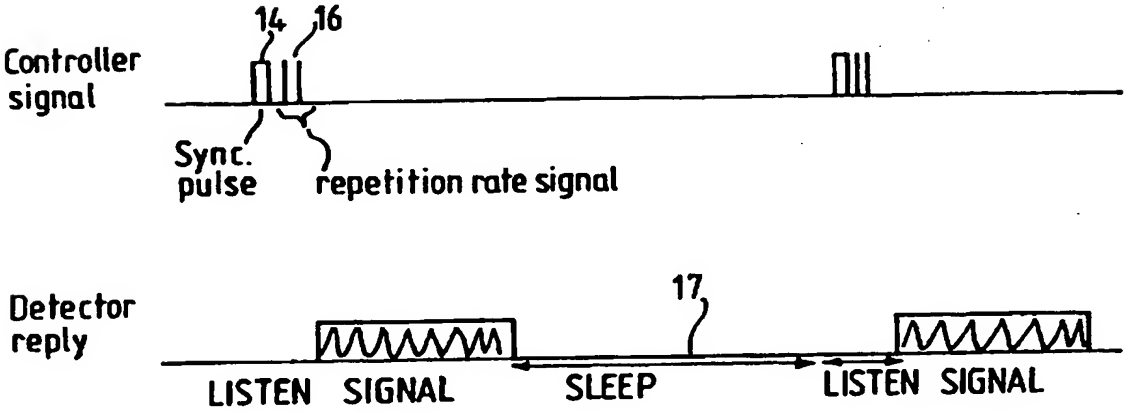

14
16
Controller signal
Sync. pulse
repetition rate signal
17
Detector reply
LISTEN
SIGNAL
SLEEP
LISTEN
SIGNAL

Fig.7.

ALARM OR DETECTION SYSTEM

This invention relates to an alarm or detection system. In particular, but not exclusively, it relates to alarm systems such as fire alarm systems comprising a central control unit and a plurality of remote stations, which may be detectors and/or sounders for example and of which at least some communication is achieved by means of wireless methods, such as radio communications.

A system of this type is disclosed in WO 94/03881.

It is common for fire systems, when installed in buildings that have more than one entrance, to be fitted with repeater panels. The function of a repeater panel is to duplicate the displays of the main control panel (control unit) such that if a fire officer were to enter a building by any particular entrance, he will still be able to see immediately what the status of the fire detection system is by looking at the repeater. Some repeater panels are also provided with control inputs which can duplicate the controls of the main panel.

Up to now, the repeater panel has been a special unit designed purely for that function. However, due to low product volumes, the cost of the repeater is often similar to that of a main panel.

According to the present invention, there is provided an alarm system comprising a plurality of detectors and/or alarm indicating devices, such as sounders and at least two physically separated functional control panels.

The control panels may all be continuously operating and display duplicate status information.

One control panel may be given highest priority at any time and will in effect operate as the system controller. According to the present invention in a preferred aspect, when said one panel acts as a system

controller, the or each other control panel is arranged to act as a repeater or slave panel.

The panels may be adapted such that if the panel which is at some point in time acting as the main control panel malfunctions or stops working for any reason, then the panel having the next priority down (the panels being arranged in a hierarchy of priorities) recognises this and takes over to control to become the main panel.

Thus, in embodiments of the invention, identical panels may be used as both the control panel and the or each repeater panel, with a consequent reduction in volume production costs since only one type of panel has to be manufactured and also enhanced security in that if one panel should fail, the or one of the other panels can take its place.

Furthermore, since the panels are substantially identical, a system operator, once he has become familiar with the panel design, can easily operate the system from any panel without requiring re-familiarisation.

The aforementioned application WO 94/03881 proposed the use of integrated sensors/detectors in a radio type fire alarm system. This approach can be a little inflexible and tends to result in a fairly high cost of combined detector/sounder units, especially since there may be some locations where only a detector is required and thus the use of an integrated unit is wasteful. Problems can also arise with such integrated units with shortened battery life.

According to the present invention in a further aspect there is provided a fire alarm system comprising a plurality of remote stations, at least some of which communicate with a central control unit by means of a wireless communication method, wherein the remote stations comprise detectors having an output and a connection means and one or more sounders each adapted to be attached to a

detector, wherein a radio transmitter, receiver or transceiver is provided in the detector for communicating with the control unit and the respective transmitter, receiver or transmitter on the detector also enables a connected sounder to communicate with the control unit.

The detectors and sounders may preferably each be provided with batteries.

A further aspect of the present invention relates to attempts to optimise battery life.

The battery life of a radio fire alarm system is generally related to the number of radio transmissions required by the system plus the electrical current needed to operate the continuous fire detection function. The fire detection function is essential and can of course not be compromised.

Radio fire systems up to now have been designed such that if a detector were to go faulty it may be several hours before this is actually detected by the system. This is because, generally, uni-directional radio transmission is used, from detector to control panel. In order to monitor the condition, (i.e. properly functioning or faulty) of each detector, detectors are arranged, in a time multiplexed manner, to transmit signals to the control panel saying that they are functioning correctly. With previous systems, the frequency of this status signal may be only once every twenty minutes, or once every hour for example from each detector. If a particular status signal is missed by the control panel for any reason, then the control panel does not automatically assume that a detector is faulty and instead waits for the next due status signal from that detector. Thus, several hours can elapse before the fact that a detector has gone faulty is known to the system.

In conventional wired alarm systems, much quicker monitoring can be obtained such that a faulty

detector is generally noted within a hundred seconds.

It is clearly advantageous to provide a radio fire system that matches the functional performance of wired systems, in particular in relation to awareness of the status of detectors.

According to the present invention in a further aspect there is provided a fire alarm system comprising a plurality of detectors communicating with a control unit by a wireless communication method, wherein at least some of the detectors and the control unit include respective transceivers for transmitting bidirectionally and the system is arranged such that periodic monitoring of the functional status of the detectors is conducted, wherein the monitoring rate is selectably variable.

The monitoring rate may be controlled by an output from the control unit, such that the monitoring rate can be varied as desired. For example, monitoring may be required to be at a fairly high frequency (e.g. 100 seconds) during working hours when the system is installed in a building, and at a lower frequency (e.g. 20 minutes, or 1 hour) during non-working hours. The output may be a pulse pattern, such that one pattern of pulses is interpreted to define a first monitoring rate and a second pattern is interpreted as a second monitoring rate.

Clearly, the lower the frequency of monitoring, the greater the potential battery life and therefore this aspect of the present invention allows for battery life to be optimised, allowing for a desired rate of monitoring as appropriate.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying schematic drawings, in which:

Figure 1 shows a radio alarm system;

Figure 2 shows the system of Figure 1 in the process of monitoring a fire;

Figure 3 shows the system of Figure 1 when the master control unit fails;

Figure 4 shows a detector/sounder assembly;

Figure 5 shows an alternative embodiment of a detector/sounder assembly;

Figure 6 shows signals transmitted by a controller and a detector during a first monitoring mode; and

Figure 7 shows signals transmitted by a controller and detector during a second monitoring mode.

Referring to Figure 1, an alarm system such as fire alarm system, comprises a plurality of detectors 1 and Sounders 2 communicating by radio signals with a master control unit 3. In a preferred embodiment, the detectors are provided with radio transmitters/receivers 4 and each sounder 2 is provided with its own battery but is linked to a respective detector 1 so as to be able to transmit and receive messages through common transmitters/receivers 4.

An additional control unit 5 is also provided in the system and this is situated remote from master control unit 3 and the plurality of detectors and sounders but is in all respects functionally identical with the master control unit 3. Thus control units 3 and 5 are identical but are arranged in a hierarchy so that control unit 3 normally has precedence in terms of control function.

It should be noted that other components will generally be included in the system and there may be some additional components which are linked by wire to each control units and the control units themselves be linked by wired means in addition to, or alternatively, to radio links. Indeed, the concepts of master/slave control units outlined in the present invention may also be applicable to alarm systems which are wholly of the wired type.

Referring to Figure 1, in normal operations the configuration is such that control unit 3 is the master control unit. This may easily be achieved by suitable programming, as will be evident to those skilled in the art. During operations, the master control unit periodically transmits polling signals to each of the respective detectors/sounders and to the or each slave unit 5 (there may be more than one slave unit present) checking that they are functioning correctly. Thus, in the figure, master control unit 3 initially sends a message enquiring whether an additional (add) unit 1 (i.e. the first detector/sounder pair) is functioning OK. This unit then replies that all this well. Control unit 3 then sends an "are you OK" message to the next detector/sounder assembly and this then replies that all is OK.

Finally, the master control unit 3 sends a message to the slave control unit 5 asking whether that is functioning correctly. The slave unit replies OK if all is well. This then repeats until an emergency situation is encountered. Figure 2 illustrates such an event. In Figure 2, it is assumed that a detector 6 has detected a fire situation. A control unit 3 first asks a first detector whether all is OK and this detector, not being in the vicinity of the fire, confirms that it is. The control unit then asks detector 6 whether all is OK and the detector 6 replies that it has detected a fire. The control unit may go immediately into a fire situation or may carry on its polling of the remaining elements of the circuit, in this case checking that the slave control unit 5 is OK. After completing the cycle, the control unit 3 then sends out a 'sound' message to each detector/sounder assembly in turn and looks for an answer from each assembly in turn, that that assembly has noted the sound command and has begun to sound the alarm. It may also

continue to call the slave unit 5 during this time to check the slave unit is still functioning correctly. The sounding continues until an operator presses a silence alarm control, and in Figure 2 it is assumed that he presses the silence alarm control at the slave controller 5. The master control unit still retains control and carries on the polling process until it reaches the slave control unit 5 which indicates that a silence command has been generated. The master control unit then acts upon this to send a silence command to each of the sounders.

Thus, in the example of Figure 2, although control has been achieved via master controller 3, it is an operation at the slave controller 5 which has caused the system to be silent again. This is possible since each control unit is fully functional.

In the event that the master controller malfunctions, i.e. does not generate any polling or other signals, then the or each slave control unit is adapted to count a time out period and , if no signals are received by that slave unit from the master unit within the time out period, the slave unit assumes that the master unit is not functioning. The next slave unit in the hierarchy then takes over command. Thus, in Figure 3, slave unit 5, after a time out period, takes over command and begins to call each of the detector/sounder assemblies in the same manner as master control unit 3 did previously. Since the slave unit 5 has all the same controls and functionality as the master unit it can take over control completely and transparently, so that functioning of the system carries on as before. It is desirable that the system provides an indication that unit 3 has malfunctioned so that unit 3 can be repaired as soon as possible.

As described, although only two control units 3 and 5 and two detector/sounder assemblies are shown in the

figure, any number of detector/sounder assemblies and any number of control units may be provided in the system. If more than two control units are provided then these may be arranged to have a predetermined hierarchy so that if a first unit fails a predetermined second unit takes command and if that unit then fails a predetermined third unit takes command and so on. Alternatively, the hierarchy may be in terms of physical location, distance (or inverse distance), from a fire or emergency situation, or otherwise. Although described for a fire alarm system, the concepts of the present invention may be utilised for other types of system.

The control panels may all be continuously operating and used to display duplicate status information so that the user can view any of the panels at any location and still get a full picture of the situation.

The choice of which panel is used as a master panel may also be given to a user so that he can select at will which panel has control, e.g. during maintenance of other panels. Also, even if one panel is being used as the master panel, full control can be obtained from any other panel when desired.

An alarm system requires detectors to detect that an emergency situation such as a fire has occurred, and also requires sounders or other alarm indicating devices. In a radio type system, a relatively expensive component in each device is a radio receiver, transmitter or transceiver. Figure 4 shows one aspect of the present invention intended to provide cost savings and which comprises a detector body 7 having its own radio transmitter/receiver 8. The detector may be a heat detector, smoke detector or other type of detector and is arranged to communicate with a control unit at one or more predetermined radio frequencies. The detector comprises its own power supply in the form of a battery 9 and may be

linked to the mains so that the battery charges when the mains is connected. The detector 7 is also provided with an alarm output module 10 which is connected to a sounder assembly 11. A battery 9 in the detector powers the transceiver, the detection function, the electronic control and alarm output. Sounder 11 is provided with sounding electronics and with its own battery 12 but does not have its own transceiver unit. Instead, messages to and from the sounder are sent via the detector 7. Bidirectional communication is therefore possible, between a control unit and detector and a control unit and sounder via a single transmitter/receiver forming part of the detector.

As shown in Figure 4, the detector and sounder may be formed as separate units which are connected by wires for example. Most preferably, however, they may be formed as a pair of plugged together units and one example of these is shown in Figure 5 schematically. In the example of Figure 5, the detector 7 is provided with a transmitter/receiver 8 and with a plug and socket connection 12 to enable connection of a sounder element 11. The plug and socket connection may be of any type and connections between detectors and sounders are well known in the art. Any type of plug and socket connection which makes a mechanical and electrical connection may be used. A transmitter/receiver unit is only provided in the detector element and not in the sounder element. The sounder and detector elements are provided with respective batteries line 9 and 13. Battery 13 powers only the sounding facilities of the sounder 13. The detection facilities, alarm output and transreceiver facilities are powered by battery 9 within a detector.

Figure 5 is a schematic drawing and many variations are possible. The concept of 'slave' sounders may of course be used with any type of radio alarm system,

including those with only one control unit.

An important consideration with radio alarm systems is battery life. Some of the greatest demands in the system are made by the radio transmitting and receiving parts and clearly battery life is proportional to the number and frequency of radio transmissions required by the system and the current needed to operate the fire detection function. The fire detection function is essential and cannot be compromised. What can be altered is the rate of monitoring.

Radio fire systems up to now have generally been designed such that if a detector were to go faulty it may be several hours before this was detected by the system since signals are only output by each detector at a low frequency, say every twenty minutes or every hour and the controller may have to wait for a second signal to be missed before it decides that a detector is faulty or is not responding properly. Conventional wire systems, on the other hand, provide monitoring such that a faulty detector is seen within a hundred seconds or less.

It is useful to provide a radio fire system that can match the functional performance of wired systems in terms of monitoring faulty detectors. However, a severe disadvantage of this would be that batteries would have to be changed much more often, say every year instead of every three years for example. According to a further aspect of invention, therefore, the monitoring rate of the detectors is controlled on site so that the monitoring rate can be varied, either at will or in a pre-determined manner. Thus, when the building is occupied during the day, a high monitoring rate may be used but at night the monitoring rate may be reduced and this therefore gives a useful saving in battery life.

One method of achieving this is by the control unit transmitting specific predetermined signals which

determine the subsequent monitoring rate. Figure 5 shows schematically how this may be achieved. Monitoring of detectors is achieved by the detectors listening for a sync pulse from a controller and then replying with a signal indicating that they are OK. Referring to the figure, the controller outputs at a predetermined repetition frequency a sync pulse 14. This is followed by a pulse pattern 15 which sets the repetition period (or rate signal) and thus determines the monitoring period. This may be a simple binary code for example which can be received and translated by the detector. The code illustrated in Figure 6 may indicate "monitoring period now 100 seconds". The detector is arranged to listen during the time when a sync pulse and repetition period signal is expected and, having received these, to provide a reply signal to the controller indicating that all is OK. Note that bidirectional communication is involved here whereas radio fire detection systems in the past used unidirectional systems.

Referring to Figure 7, signals on the same system are shown and in this case the sync pulse from the controller 14 is followed by a different repetition rate signal 16 which a detector translates as meaning that a different monitoring rate is now instigated. The detector listens as normal during the period when the sync pulse and repetition rate signal is expected and , having received these and decoded the repetition rate signal, the detector replies back to the controller that all is OK. The detector then goes into a sleep mode 17 for a time period dependent upon the monitoring frequency. At the end of the predetermined sleep period, the detector goes into a listening period during the time when the next sync pulse and repetition rate signal is expected. Provided it receives this, then the detector issues a reply that all is well and then goes into a further sleep

mode. Clearly, if the repetition rate signal changes after any particular sync pulse then the detector notes this and goes into the required monitoring mode.

Although it will usually only be necessary to have two different monitoring modes, as an alternative several different monitoring modes or periods may be used, e.g. a day mode, a night mode, a weekend mode, and so on, each with different monitoring rates.

The variable monitoring techniques may be used with many types of alarm system, including those with only one control unit.

CLAIMS

1. An alarm system comprising a plurality of remote detection and/or alarm indicating devices and at least two physically separated functional control panels, each control panel being capable of fully controlling the alarm system, the arrangement being such that at any time one of the control panels is used as a master control panel.

2. An alarm system as claimed in Claim 1, wherein the control panels are all continuously operating during operation of the alarm system and all display duplicate status information.

3. An alarm system as claimed in Claim 1 or Claim 2, wherein a hierarchy is established such that if a control panel which is acting as a master control panel malfunctions, the next control panel in the hierarchy is adapted to sense this and to become the new master control panel.

4. An alarm system as claimed in any preceding claims, wherein the components communicate at least partially by radio transmission.

5. An alarm system as claimed in any preceding claims, wherein when one control panel is acting as a master control panel an operator can still cause any other control panel to provide any control functions on the system.

6. An alarm system as claimed in any preceding claim whereas the remote devices comprise detectors having an output and a radio transmitter/receiver or transceiver and wherein an alarm indicating device is connected to at least one of the detectors, the indicating device being connected to the output of the detector such that the respective transmitter, receiver or transceiver on the detector also enables the connected sounder to communicate with the control unit.

7. An alarm system as claimed in Claim 6, wherein

the detectors and/or sounders are each provided with separate batteries.

8. An alarm system as claimed in any preceding claim, wherein at least some of the remote devices and the control unit include respective transceivers for transmitting bidirectionally and wherein the system is arranged such that periodic monitoring of the functional status of the detectors is conducted, wherein the monitoring rate is selectively variable.

9. An alarm system as claimed in Claim 8, wherein the monitoring rate is controlled by an output from the control unit.

10. An alarm system as claimed in Claim 9, wherein the output is a pulse pattern such that one predetermined pulse pattern is interpreted by a remote device to define a first monitoring rate and at least one further pattern is interpreted to define at least one further monitoring rate.

11. A fire alarm system comprising a plurality of remote stations, at least some of which communicate with a central control unit by means of a wirelesss communication method, wherein the remote stations comprise detectors having an output and a connection means and one or more sounders each adapted to be detachably connected to a detector, wherein a radio transmitter, receiver or transreceiver is provided at the detector for communicating with the control unit and the respective transmitter, receiver or transmitter on the detector also enables a connected sounder to communicate with the control unit via the detector.

12. A fire alarm system as claimed in Claim 11, wherein the detectors and sounders are each provided with their own battery means.

13. A fire alarm system comprising a plurality of detectors communicating with a control unit by a wireless

communication method, whereas at least some of the detectors and the control unit include respective transceivers for transmitting bidirectionally and the system is arranged such that periodic monitoring of the functional status of the detectors is conducted by transmission of signals, wherein the monitoring rate is selectively variable.

14. A fire alarm system as claimed in Claim 13, wherein the monitoring rate is controlled by an output from the control unit.

15. A fire alarm system as claimed in Claim 14, wherein the output is a pulse pattern, selected such that one predetermined pulse pattern is interpreted by the detector to define a first monitoring rate and at least a second pulse pattern is interpreted to define at least a second monitoring rate.

16. An alarm or detection system substantially as hereinbefore described with reference to, and as illustrated by, any of the accompanying drawings.

Amendments to the claims have been filed as follows

1. An alarm system comprising a plurality of remote detection and/or alarm indicating devices and at least two physically separated functional control panels, each control panel being capable of fully controlling the alarm system, the arrangement being such that at any time one of the control panels is used as a master control panel.

2. An alarm system as claimed in Claim 1, wherein the control panels are all continuously operating during operation of the alarm system and all display duplicate status information.

3. An alarm system as claimed in Claim 1 or Claim 2, wherein a hierarchy is established such that if a control panel which is acting as a master control panel malfunctions, the next control panel in the hierarchy is adapted to sense this and to become the new master control panel.

4. An alarm system as claimed in any preceding claims, wherein the components communicate at least partially by radio transmission.

5. An alarm system as claimed in any preceding claims, wherein when one control panel is acting as a master control panel an operator can still cause any other control panel to provide any control functions on the system.

6. An alarm system as claimed in any preceding claim whereas the remote devices comprise detectors having an output and a radio transmitter/receiver or transceiver and wherein an alarm indicating device is connected to at least one of the detectors, the indicating device being connected to the output of the detector such that the respective transmitter, receiver or transceiver on the detector also enables the connected sounder to communicate with the control unit.

7. An alarm system as claimed in Claim 6, wherein

the detectors and/or sounders are each provided with separate batteries.

8. An alarm system as claimed in any preceding claim, wherein at least some of the remote devices and the control unit include respective transceivers for transmitting bidirectionally and wherein the system is arranged such that periodic monitoring of the functional status of the detectors is conducted, wherein the monitoring rate is selectively variable.

9. An alarm system as claimed in Claim 8, wherein the monitoring rate is controlled by an output from the control unit.

10. An alarm system as claimed in Claim 9, wherein the output is a pulse pattern such that one predetermined pulse pattern is interpreted by a remote device to define a first monitoring rate and at least one further pattern is interpreted to define at least one further monitoring rate.

11. A fire alarm system comprising a plurality of remote stations, at least some of which communicate with a central control unit by means of a wirelesss communication method, wherein the remote stations comprise detectors having an output and a connection means and one or more sounders each adapted to be detachably connected to a detector, wherein a radio transmitter, receiver or transreceiver is provided at the detector for communicating with the control unit and the respective transmitter, receiver or transmitter on the detector also enables a connected sounder to communicate with the control unit via the detector.

12. A fire alarm system as claimed in Claim 11, wherein the detectors and sounders are each provided with their own battery means.

13. A fire alarm system comprising a plurality of detectors communicating with a control unit by a wireless

communication method, wherein at least some of the detectors and the control unit include respective transceivers for transmitting bidirectionally and the system is arranged such that periodic monitoring of the functional status of the detectors is conducted by transmission of signals, wherein the monitoring rate is selectively variable, so as to reduce the monitoring rate, and thereby conserve battery power, at times when less frequent monitoring is acceptable.

14. A fire alarm system as claimed in Claim 13, wherein the monitoring rate is controlled by an output from the control unit.

15. A fire alarm system as claimed in Claim 14, wherein the output is a pulse pattern, selected such that one predetermined pulse pattern is interpreted by the detector to define a first monitoring rate and at least a second pulse pattern is interpreted to define at least a second monitoring rate.

16. An alarm or detection system substantially as hereinbefore described with reference to, and as illustrated by, any of the accompanying drawings.

The Patent Office

L9

Application No:	GB 9721518.0	**Examiner:**	Mike Davis
Claims searched:	1-10	**Date of search:**	3 February 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G4H (HNK)

Int Cl (Ed.6): G08B

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
	None	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

The Patent Office

20

Application No:	GB 9721518.0	**Examiner:**	Mike Davis
Claims searched:	11-12	**Date of search:**	10 June 1998

Patents Act 1977
Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G4H (HNEC, HNEE, HNEM, HNMB)

Int Cl (Ed.6): G08B

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
	None	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

The Patent Office

21

Application No: GB 9721518.0
Claims searched: 13-15

Examiner: Mike Davis
Date of search: 10 June 1998

Patents Act 1977
Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G4H (HNEC, HNEE, HNEM, HNK, HNLA, HNG)

Int Cl (Ed.6): G08B

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2207266 A	(SCANNING TECHNOLOGY)	13 at least
X	EP 0599192 A1	(GRUNDIG)	*

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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